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UPROOT
ALL
THESE BUSHES PROMPTLY

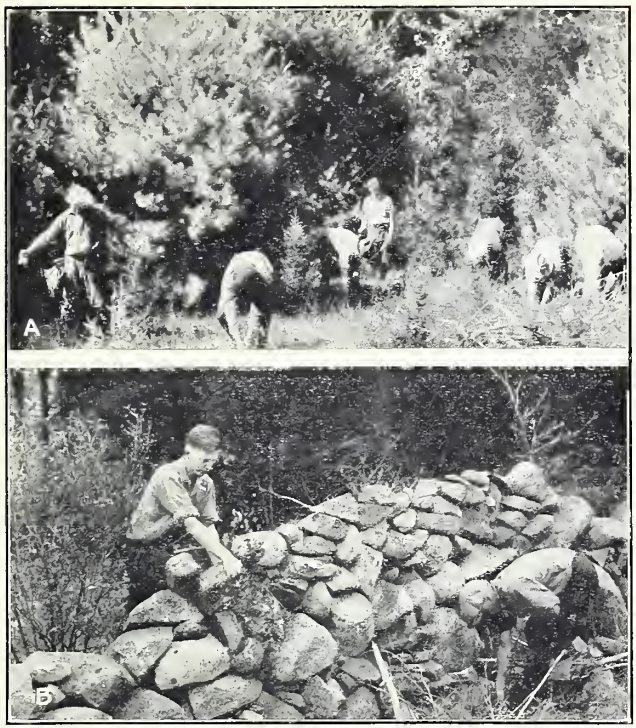

Fig. 8. A.—Protecting white pine from blister rust by systematically uprooting wild currants and gooseberries
B.—A two-man crew effectively destroying wild currants and gooseberries along a stone wall

CONTROL MEASURES

Any white-pine stand can be protected from blister rust by uprooting all currants and gooseberries within infecting distance of the pines. The width of the protective strip around white pine varies with local field conditions, but 900 feet gives ample protection under average conditions in eastern forests. For effective work, it is necessary to know the different kinds of wild currants and gooseberries. If these bushes occur in patches, they may be destroyed efficiently by one or two trained men. If scattered generally throughout a pine stand, a crew of three to six men supervised by a foreman should be used to examine systematically all of the ground in parallel strips. Such a crew should mark the edge of each strip so that no ground will be missed or needlessly reworked. The bushes can be uprooted by hand or, if firmly rooted, with a suitable grubber. Sprouting is prevented by removing the crown and large roots. The cost is reasonable but varies with the difficulties encountered. One or more thorough workings are required to establish and maintain protection of the pine on areas where control work is necessary.

PROTECT WHITE PINE
FROM
BLISTER RUST

BUREAU OF PUBLIC ROADS
JUL 1 1927 JUN 29 1928
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Fig. 1.—A maturing natural stand of eastern white pine

IMPORTANCE OF WHITE PINES

The value of white and sugar pine timber in the forests of the United States is about $550,000,000. In addition there are several million acres of young growth which will become valuable timber in the future. Foresters advise that the maintenance of these pines in our forests is of great importance because of their rapid growth, excellent wood, high yield, and adaptability to forest management. Wherever white pines grow, from Maine to California, they constitute the cream of the forest and are far more valuable than the associated species. With such an essential and valuable resource at stake, affecting national, regional, and local economic welfare, it is important that Federal, State, and private agencies cooperate in a united effort to accomplish control of the white-pine blister rust.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
and the States of California, Connecticut, Idaho, Maine, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, and Wisconsin cooperating.
Miscellaneous Publication No. 22
(Eastern Edition)

By J. F. MARTIN, Pathologist

Washington, D. C., April, 1928
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HOW BLISTER RUST SPREADS

Fig. 2.—Blister-rust canker producing spring spores which infect the leaves of currants and gooseberries

Fig. 3.—Diseased wild gooseberry producing the fall spores which infect white pines. Inset, diseased leaf

SPREAD FROM WHITE PINES

Blister rust is a fungous disease of white pines (five-needled pines) and currant and gooseberry plants. It enters white pines through the needles and grows into the bark. The diseased areas in the bark are called cankers. The cankers are usually spindle shaped, with swollen bark and a yellowish discoloration around their edges. About three years after a tree is infected, orange-yellow blisters break through the diseased bark of mature cankers. From these blisters millions of spores are scattered over long distances by the wind and infect the leaves of currant and gooseberry plants. These spores may remain alive several weeks and are called spring spores to distinguish them from the summer and fall spores that are produced on the leaves of currants and gooseberries. Following the production of blisters, the broken bark dies. The fungus continues its growth in the live bark and produces new blisters each spring. **The disease can not go directly from one pine to another. From infected white pines it spreads only to currant and gooseberry leaves.**

SPREAD FROM CURRANTS AND GOOSEBERRIES

The fungus is not noticeable on currant and gooseberry plants until it has grown in the leaves for a period of two or three weeks. Then small orange-yellow spots appear on the under surface of the infected leaves. These spots contain the summer spores, which spread the disease locally on currants and gooseberries. The summer spores may survive several weeks and greatly increase the amount of disease on the leaves of these plants. **From late June until the leaves drop, brownish hairlike growths of the fungus replace the spots in increasing abundance.**

These outgrowths produce the fall spores, which infect white pines within a short radius of diseased currants and gooseberries. The fall spores are spread by the wind, but they are so delicate and consequently short lived that their infecting range is limited to short distances. This makes it possible to control the disease locally by destroying the currants and gooseberries in the vicinity of white pines.

AND DESTROYS WHITE PINE

Fig. 4.—Infected white-pine stand before blister-rust damage becomes noticeable

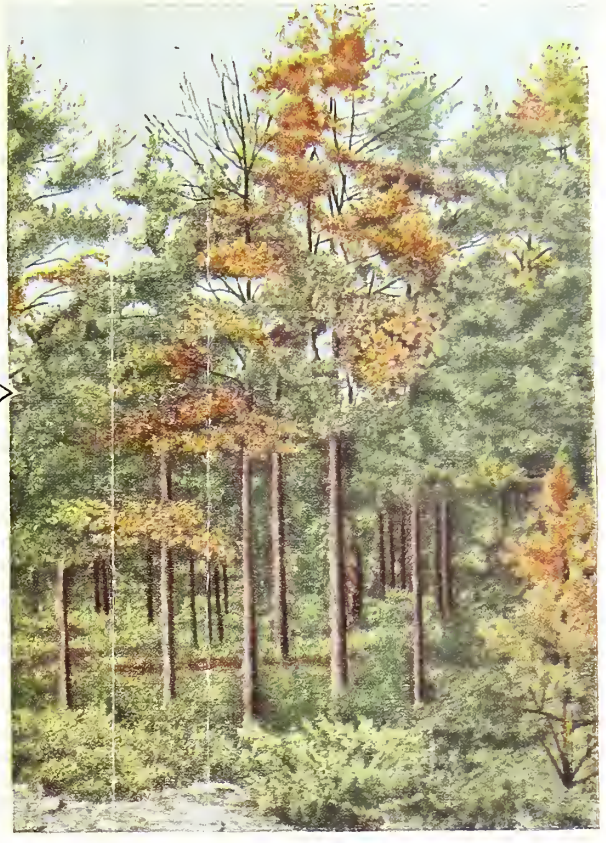

Fig. 5.—The same stand showing blister-rust damage

APPEARANCE OF DISEASED PINES

The early stages of the disease on pine are obscure and easily escape notice. However, the disease attracts attention when it begins to kill the branches. Newly infected young trees appear normal and healthy, but a careful inspection will reveal unsuspected immature cankers. As these cankers get older, the affected portions of the pines gradually die. Badly diseased young trees are often stunted and bushy, have short yellowish needles, and present a general unhealthy appearance. Pines of medium or large size if lightly infected may appear normal for several years except for an occasional dead or dying branch. Such branches are called "flags" because they are very noticeable against the green foliage. Branch cankers, occurring close to the trunk, girdle and kill the trees within a few years, while those more distant either die or require a much longer time to reach the trunk. Usually pines with old infections are in a dying condition and are characterized by dead and dying branches, broken-off tops, and trunk cankers covered with pitch.

DAMAGE TO WHITE PINES

Blister rust kills white pines of all sizes. The smaller the trees the sooner they die. In many local pine areas where the disease has been present for several years, from 50 to 100 per cent of the trees are dead or dying. Within the infected regions the disease is preventing natural restocking of pine in unprotected areas by killing the young trees soon after they appear. Injury to older trees is indicated first by the presence of dead and dying branches. Later, the trunks are girdled and the trees die. Sometimes the death of large trees is caused by numerous cankers which kill all the branches. Stem cankers retard the growth of the trees, and the trunks often break off at the point of girdling. Usually the first infection of pines is relatively light, but with each succeeding year new infections occur and the resulting cankers increase in number and size until the trees are killed. The death of pines weakened by blister rust is hastened by the secondary attacks of other fungi and of rodents and insects. Rodents injure the trees by eating portions of the diseased bark.

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STOP

THE

DESTRUCTION OF WHITE PINE

Fig. 6.—White pines killed by blister rust

SPREAD OF THE DISEASE

White-pine blister rust is a forest-tree disease which came from Europe on white-pine planting stock. It was first discovered in North America in 1906 and is now present in the New England States, New York, New Jersey, Pennsylvania, Michigan, Wisconsin, Minnesota, Idaho, Washington, and Oregon. In Canada it occurs in the Provinces of British Columbia, Ontario, Quebec, Prince Edward Island, New Brunswick, and Nova Scotia. In time it will probably spread naturally throughout the range of white pines. Its further distribution through the shipment of diseased white pines, currants, or gooseberries is prevented by quarantines which regulate their movement. Before one ships any of these plants he should obtain a copy of the regulations governing their movement from the State nursery inspector. In infected regions the disease develops where white pines and currants or gooseberries occur together. When the blister rust appears in a locality, owners of white pine should promptly apply control measures to prevent loss from this disease.

LOOK

FOR

CURRANTS AND GOOSEBERRIES

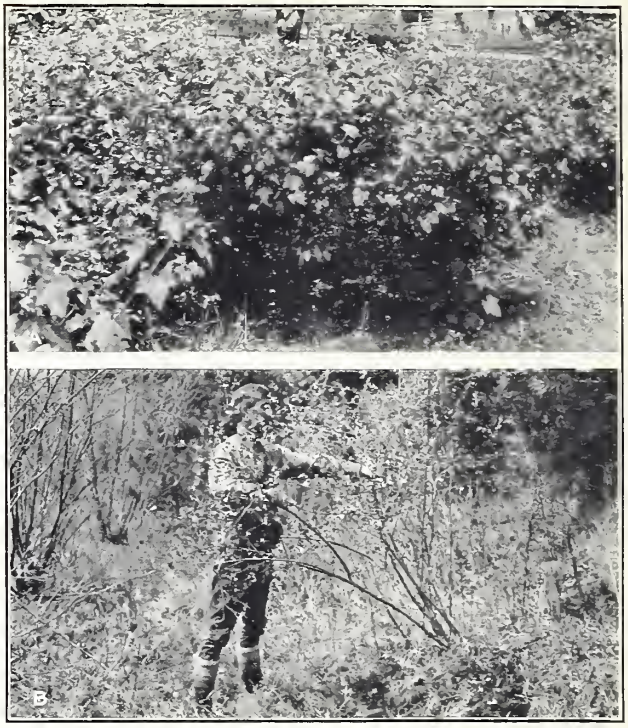

Fig. 7. A.—The European black currant, a cultivated plant
B.—A wild gooseberry, commonly found in white-pine forests

WILD AND CULTIVATED CURRANTS AND GOOSEBERRIES

Several kinds of wild currants and gooseberries grow in greater or less abundance in white-pine areas, so that forest conditions are generally favorable for the spread of the rust. These plants vary in size, habit of growth, and in their soil, moisture, and light requirements. Usually they are found in places where white pines are native, although in some localities they are practically absent. Pine owners should treat wild currants and gooseberries as dangerous weeds and uproot them whenever found. **The European or cultivated black currant (Ribes nigrum L.) is more susceptible to blister rust than other currants or gooseberries. It becomes infected at distances up to 100 or more miles from diseased pines and causes new centers of pine infection. The ease with which this currant becomes infected makes it an important agent in the long-distance spread and local establishment of blister rust in disease-free regions. Because of the economic importance of white pine, several States have declared the cultivated black currant a public nuisance. The United States Department of Agriculture is opposed to the growing of this plant in the United States and recommends its elimination in States where white pines are important forest trees.**